Alternation of Generation

反思扣件技术的承袭

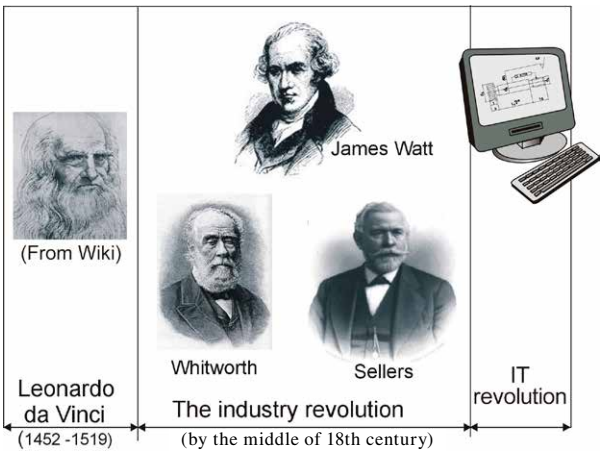
Alternation of generations can be defined as the reproductive cycle of living nature. Of course, this topic belongs more to the field of philosophy than to the pages of a technical engineering magazine, but this also applies in general to the carriers of progress in the field of mechanical joining of parts, even much more significantly than in other areas. And why?

Because
Thread = The Bread for Technical Progress!

At first glance, the meaning of the words in the title seems exaggerated. In the eyes of not only the lay public, screws are perceived as a less important structural element. What is the truth now? Few people realize what an important role the pioneers of the technical revolution and their vanguard - promoters of the mechanical joining of parts using threaded joints - played in life. It should be added here that screws would not be screws if there was no natural property of matter - friction. All of this had to be understood first by "reason, the most beautiful ray of heavenly light", as a Nobel Prize laureate Romain Rolland says. Thank God, that this ray radiates knowledge one generation after another. This is also confirmed by a famous physicist Isaac Newton: "If I have seen further it is by standing on the shoulders of giants". So the alternation of generations, which mutually exchange experiences, is the basis of social progress. Let's look at **Fig. 1**. Perhaps the greatest genius in the realms of mankind, Leonardo da Vinci left an admirable message from which future generations benefited. Basically, it enabled the birth of technical revolution. Johann Gutenberg, the inventor of the printing press (**Fig. 2**), should be mentioned in particular. His discovery turned out to be very important, because it started the mass production of books and, in connection with that, the information and scientific revolution and the spread of education among wider classes. Similarly, the steam engine designer James Watt (**Fig. 3**). Or, although it is not known who was the first to construct a roller (**Fig. 4**), in any case it would not have been possible without a strong generation of thread (**Fig. 5**) connection pioneers such as Joseph Whitworth or William Sellers (in **Fig. 1**). Of course they weren't alone, and the development continued.

The most difficult work of designer doesn't end here, but just begins!

Fig. 1. Generations



Continuation of Development

With the onset of IT revolution, it became possible to study the behavior of screw joints during assembly and in operating conditions. The use of the Finite Element Method (FEM), which replaced the complicated and impractical photoelastometric observation, meant visible progress in the field of studying stress distribution during stressing of structural elements (**Fig. 6**). Based on FEM analysis, it is possible to take effective measures against the collapse of bolted joints during operation. The current generation of engineers can do what their predecessors could not even dream of - comfortably with the help of a computer to see inside a screw connection. Unfortunately, another thing is that not everyone can

Fig. 2. Printing press

Fig. 3. Steam engine

Fig. 4. Roller

correctly interpret the knowledge gained. And here we are at the basic problem of the current technocratic generation. Yes, we have excellent computer programs at our disposal and most students are proficient in them, but there are great reserves in interpretation skills. Today, it is no longer enough to just choose the right software, enter the input parameters and wait for the result.

Conclusion

As we have seen, each change of generations means a qualitative shift in scientific and technical knowledge to a higher level. Anyone who thinks that screw joints play only a minor role in this social cycle is very much mistaken. Almost all conquests of the technical revolution were, are and will be in future dependent on screw connections. Today, when we are in the field of IT revolution (Fig. 1), it is very important that the young generation, above all, realizes this. From this point of view, the question arises as to whether the curricula at vocational schools and technical universities are correct and whether they respond to current social needs. Because I am in close contact with important technical universities not only in SK and CZ, but e.g. even in Germany, such as TU Darmstadt and TU Zwickau, where I occasionally lecture, I can confirm the declining interest of students in this topic. Why this is so and how to stop this unfavorable development is a longer discussion. Perhaps it would help if some agency found the courage to create a platform for publishing a purely scientifically oriented magazine on this topic. I am ready to help. I've also thought of a suitable name - Science Friction.

Article by Jozef Dominik and Dominik Makuka

Fig. 5. Thread connection

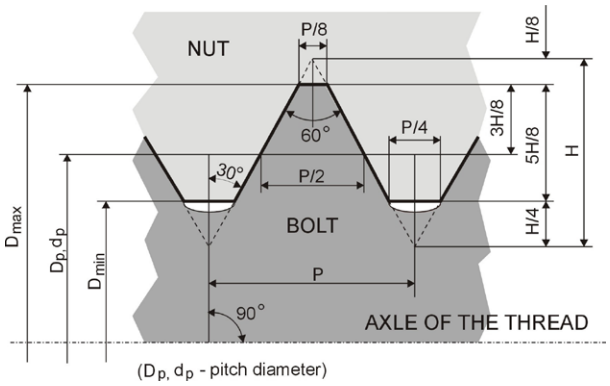


Fig. 6. FEM Method (FM = Montage power)